WHAT IS CLAIMED IS:

1. A method for determining characteristics of a thin film, comprising:

irradiating with a monitor light ray at least a position of a processing target which is irradiated with a light energy which can perform predetermined processing or finishing;

detecting a reflected light ray generated from the processing target by the monitor light ray by a light sensing mechanism having a plurality of substantially continuous light sensing elements; and

measuring a temporal change in an angle distribution of an intensity of the reflected light detected by the light sensing mechanism.

2. The method for determining characteristics of a thin film according to claim 1, wherein the light sensing mechanism includes a strip-like fluorescence surface which extends in one arbitrary direction.

3. The method for determining characteristics of a thin film according to claim 2, the measurement of the temporal change in the angle distribution of the intensity of the reflected light is to generate electrons corresponding to the reflected light detected by the light sensing mechanism, guide the generated electrons to the fluorescence surface in a strip-like shape extending in one arbitrary direction by an electric field which varies with time, and obtain data

for each time acquired on the fluorescence surface.

4. The method for determining characteristics of a thin film according to claim 3, wherein the data is indicated based on the refractive index and the extinction coefficient.

5. The method for determining characteristics of a thin film according to claim 1, wherein the thin film includes at least one of a thin film containing silicon as a main component, an amorphous silicon hydride thin film, a sputtered silicon thin film, a silicon germanium thin film, and a dehydrated amorphous silicon thin film.

6. The method for determining characteristics of a thin film according to claim 1, wherein the monitor light ray includes laser light ray and is condensed on the thin film through a lens system.

7. The method for determining characteristics of a thin film according to claim 1, wherein the monitor light includes a light ray that a direction of polarization is set in a specific direction.

8. The method for determining characteristics of a thin film according to claim 1, further comprising:

calculating a temporal change in a refractive index and an extinction coefficient of the processing target based on the measured temporal change in the angle distribution of the intensity of the reflected light ray.

9. The method for determining characteristics of a thin film according to claim 8, wherein the light sensing mechanism includes a strip-like fluorescence surface which extends in one arbitrary direction.

10. The method for determining characteristics of a thin film according to claim 9, the measurement of the temporal change in the angle distribution of the intensity of the reflected light is to generate electrons corresponding to the reflected light detected by the light sensing mechanism, guide the generated electrons to the fluorescence surface in a strip-like shape extending in one arbitrary direction by an electric field which varies with time, and obtain data for each time acquired on the fluorescence surface.

11. The method for determining characteristics of a thin film according to claim 10, wherein the data is indicated based on the refractive index and the extinction coefficient.

12. The method for determining characteristics of a thin film according to claim 8, wherein the thin film includes at least one of a thin film containing silicon as a main component, an amorphous silicon hydride thin film, a sputtered silicon thin film, a silicon germanium thin film, and a dehydrated amorphous silicon thin film.

13. The method for determining characteristics of a thin film according to claim 8, wherein the monitor

light ray includes laser light ray and is condensed on the thin film through a lens system.

14. The method for determining characteristics of a thin film according to claim 8, wherein the monitor light includes a light ray that a direction of polarization is set in a specific direction.

15. An apparatus for specifying a processing state and/or a finishing state of a processing target, comprising:

a monitor light generation device which can irradiate with a monitor light ray at least a position of a processing target which is irradiated with a light energy which can perform predetermined processing or finishing;

a light sensing mechanism which detects a reflected light ray generated from the processing target irradiated with the monitor light ray, and detects electrons corresponding to the reflected light ray and/or a light ray obtained by converting the electrons corresponding to the reflected light ray; and

a reflected light measurement mechanism which measures a temporal change in an angle distribution of an intensity of the reflected light ray detected by the light sensing mechanism.

16. The apparatus for specifying a processing state and/or finishing state of a processing target, according to claim 15, further comprising:

a state specifying device which specifies a state of the processing target based on the temporal change in the refractive index and the extinction coefficient of the processing target calculated by the signal processing mechanism.

17. The apparatus for specifying a processing state and/or a finishing state of the processing target according to claim 15, further comprising:

a light multiplication mechanism which multiplies an intensity of the reflected light ray generated from the processing target irradiated with the monitor light ray after this light enters the light sensing mechanism.

18. The apparatus for specifying a processing state and/or a finishing state of a processing target according to claim 15, wherein the reflected light measurement mechanism includes a streak camera.

19. The apparatus for specifying a processing state and/or a finishing state of a processing target according to claim 16, wherein the reflected light measurement mechanism includes a streak camera.

20. The apparatus for specifying a processing state and/or a finishing state of a processing target according to claim 17, wherein the reflected light measurement mechanism includes a streak camera.

21. The apparatus for specifying a processing state and/or a finishing state of a processing target

according to claim 17, wherein the light multiplication mechanism includes an image intensifier.

22. The apparatus for specifying a processing state and/or a finishing state of a processing target according to claim 17, wherein the light multiplication mechanism includes a Microchannel Plate.

23. The apparatus for specifying a processing state and/or a finishing state of a processing target, according to claim 15, further comprising:

a signal processing mechanism which calculates a temporal change in a refractive index and an extinction coefficient of the processing target based on the temporal change in the angle distribution of the intensity of the reflected light ray measured by the reflected light measurement mechanism.

24. The apparatus for specifying a processing state and/or finishing state of a processing target, according to claim 23, further comprising:

a state specifying device which specifies a state of the processing target based on the temporal change in the refractive index and the extinction coefficient of the processing target calculated by the signal processing mechanism.

25. The apparatus for specifying a processing state and/or a finishing state of the processing target according to claim 23, further comprising:

a light multiplication mechanism which multiplies

an intensity of the reflected light ray generated from the processing target irradiated with the monitor light ray after this light enters the light sensing mechanism.

26. The apparatus for specifying a processing state and/or a finishing state of a processing target according to claim 23, wherein the reflected light measurement mechanism includes a streak camera.

27. The apparatus for specifying a processing state and/or a finishing state of a processing target according to claim 24, wherein the reflected light measurement mechanism includes a streak camera.

28. The apparatus for specifying a processing state and/or a finishing state of a processing target according to claim 25, wherein the reflected light measurement mechanism includes a streak camera.

29. The apparatus for specifying a processing state and/or a finishing state of a processing target according to claim 25, wherein the light multiplication mechanism includes an image intensifier.

30. The apparatus for specifying a processing state and/or a finishing state of a processing target according to claim 25, wherein the light multiplication mechanism includes a Microchannel Plate.

31. An apparatus for determining characteristics of a semiconductor thin film irradiated with an annealing laser beam, comprising:

a monitor light irradiator which irradiates with a monitor light ray a position irradiated with the laser beam; and

a reflected light measurement device which receives a reflected light ray of the monitor light ray from the thin film, has a light sensing surface having a plurality of substantially continuous light sensing elements, and measures a temporal change in an angle distribution of an intensity of the reflected light ray.

32. The apparatus for determining characteristics of a semiconductor thin film irradiated with an annealing laser beam according to claim 31, wherein the light sensing surface includes a fluorescence surface having a strip-like plane shape.

33. The apparatus for determining characteristics of a semiconductor thin film irradiated with an annealing laser beam according to claim 31, wherein the reflected light measurement device includes a photoelectric conversion portion which generates electrons corresponding to the reflected light ray received on the photoelectric surface, and an electric field generation portion which passes the generated electrons through an electric field which varies with time.

34. The apparatus for determining characteristics of a semiconductor thin film irradiated with an

annealing laser beam according to claim 31, further comprising a lens optical system which condenses the monitor light ray on the thin film and passes the reflected light ray therethrough.

35. The apparatus for determining characteristics of a semiconductor thin film irradiated with an annealing laser beam according to claim 31, further comprising:

a signal processing device which calculates a temporal change in a refractive index and an extinction coefficient of the thin film based on the temporal change in the angle distribution of the intensity of the reflected light ray.

36. The apparatus for determining characteristics of a semiconductor thin film irradiated with an annealing laser beam according to claim 35, wherein the light sensing surface includes a fluorescence surface having a strip-like plane shape.

37. The apparatus for determining characteristics of a semiconductor thin film irradiated with an annealing laser beam according to claim 35, wherein the reflected light measurement device includes a photoelectric conversion portion which generates electrons corresponding to the reflected light ray received on the photoelectric surface, and an electric field generation portion which passes the generated electrons through an electric field which varies with

time.

38. The apparatus for determining characteristics of a semiconductor thin film irradiated with an annealing laser beam according to claim 35, further comprising a lens optical system which condenses the monitor light ray on the thin film and passes the reflected light ray therethrough.

39. An apparatus for determining characteristics of a thin film, comprising:

a monitor light irradiator which irradiates a monitor light ray having a polarization light in a direction of the polarization light is a predetermined direction, and the monitor light ray is condensed on the thin film through a lens system; and

a light measurement device which receives a reflected light ray of the monitor light ray from the thin film, has a light sensing surface having a plurality of substantially continuous light sensing elements, and measures a temporal change in an angle distribution of an intensity of the reflected light ray.

40. The apparatus for determining characteristics of a thin film according to claim 39, further comprising:

a signal processing device which calculates a temporal change in a refractive index and an extinction coefficient of the thin film based on the temporal

change in the angle distribution of the intensity of the reflected light ray detected by the light measurement device.

41. An apparatus for determining characteristics of a thin film, comprising:

a monitor light irradiator which irradiates a monitor light ray having a polarization light in a direction of the polarization light is a predetermined direction, and the monitor light ray is condensed on the thin film through a lens system;

a first light measurement device which receives a reflected light ray of the monitor light ray from the thin film, has a first light sensing surface having a plurality of substantially continuous light sensing elements, and measures a temporal change in an angle distribution of an intensity of the reflected light ray; and

a second light measurement device which receives a reflected light ray of the monitor light ray from the thin film, has a second light sensing surface having a plurality of substantially continuous light sensing elements each arranged orthogonal to the first light measurement device, and measures a temporal change in an angle distribution of an intensity of the reflected light ray.

42. The apparatus for determining characteristics of a thin film according to claim 41, further

comprising:

a signal processing device which calculates a temporal change in a refractive index and an extinction coefficient of the thin film based on the temporal change in the angle distribution of the intensity of the reflected light ray detected by the first and second light measurement devices.

43. An apparatus for determining characteristics of a thin film, comprising:

a monitor light irradiator which irradiates a monitor light ray having at least one of the S polarization light and the P polarization light, and the monitor light ray is condensed on the thin film through a lens system; and

a light measurement device which receives a reflected light ray of the monitor light ray from the thin film, has a light sensing surface having a plurality of substantially continuous light sensing elements, and measures a temporal change in an angle distribution of an intensity of the reflected light ray.

44. The apparatus for determining characteristics of a thin film according to claim 43, further comprising:

a signal processing device which calculates a temporal change in a refractive index and an extinction coefficient of the thin film based on the temporal

change in the angle distribution of the intensity of the reflected light ray detected by the light measurement device.

45. An apparatus for determining characteristics of a thin film, comprising:

a monitor light irradiator which irradiates a monitor light ray having at least one of the S polarization light and the P polarization light, and the monitor light ray is condensed on the thin film through a lens system;

a first light measurement device which receives a reflected light ray of the monitor light ray from the thin film, has a first light sensing surface having a plurality of substantially continuous light sensing elements, and measures a temporal change in an angle distribution of an intensity of the reflected light ray; and

a second light measurement device which receives a reflected light ray of the monitor light ray from the thin film, has a second light sensing surface having a plurality of substantially continuous light sensing elements each arranged orthogonal to the first light measurement device, and measures a temporal change in an angle distribution of an intensity of the reflected light ray.

46. The apparatus for determining characteristics of a thin film according to claim 45, further

comprising:

a signal processing device which calculates a temporal change in a refractive index and an extinction coefficient of the thin film based on the temporal change in the angle distribution of the intensity of the reflected light ray detected by the first and second light measurement devices.

47. A method for determining characteristics of a thin film, comprising:

irradiating with a monitor light ray includes a polarization light in a direction of the polarization is a predetermined direction which is irradiated with a light energy which can perform predetermined processing or finishing;

detecting a reflected light ray generated from the processing target by the polarization light of the monitor light ray by a light sensing mechanism having a plurality of substantially continuous light sensing elements; and

measuring a temporal change in an angle distribution of an intensity of the reflected the light detected by the light sensing mechanism.

48. A method for determining characteristic of thin film, comprising:

irradiating with a monitor light ray includes a polarization light in a direction of the polarization is a predetermined direction which is irradiated with a

light energy which can perform predetermined processing or finishing;

detecting a reflected light ray generated from the processing target by the polarization light of the monitor light ray by a light sensing mechanism having a plurality of substantially continuous light sensing elements;

measuring a temporal change in an angle distribution of an intensity of the reflected the light detected by the light sensing mechanism; and

calculating a temporal change in a refractive index and an extinction coefficient of the processing target based on the measured temporal change in the angle distribution of the intensity of the reflected light.

49. A method for determining characteristic of thin film, comprising:

irradiating with a monitor light ray includes at least one of the S polarization light and the P polarization light orthogonal the each of polarization direction which is irradiated with a light energy which can perform predetermined processing or finishing;

detecting a reflected light ray generated from the processing target by the first polarization light of the monitor light ray by a first light sensing mechanism having a plurality of substantially continuous light sensing elements;

detecting a reflected light ray generated from the processing target by the second polarization light of the monitor light ray by a second light sensing mechanism having a plurality of substantially continuous light sensing elements arranged orthogonal to the light sensing elements of the first light sensing mechanism; and

measuring a temporal change in an angle distribution of an intensity of the reflected the first and second lights each detected by the first and the light sensing mechanisms.

50. A method for determining characteristic of thin film, comprising:

irradiating with a monitor light ray includes at least one of the S polarization light and the P polarization light orthogonal the each of polarization direction which is irradiated with a light energy which can perform predetermined processing or finishing;

detecting a reflected light ray generated from the processing target by the first polarization light of the monitor light ray by a first light sensing mechanism having a plurality of substantially continuous light sensing elements;

detecting a reflected light ray generated from the processing target by the second polarization light of the monitor light ray by a second light sensing mechanism having a plurality of substantially

continuous light sensing elements arranged orthogonal to the light sensing elements of the first light sensing mechanism;

measuring a temporal change in an angle distribution of an intensity of the reflected the first and second lights each detected by the first and the light sensing mechanisms; and

calculating a temporal change in a refractive index and an extinction coefficient of the processing target based on the measured temporal change in the angle distribution of the intensity of the reflected first and second lights.